

NASA Science Mission Directorate - Applied Sciences Program

Public Health – Fiscal Year 2005 Annual Report *



SUMMARY

The Public Health program element pursued numerous activities to extend the use of NASA Earth science research results to improve the understanding of and response to factors in the environment that adversely impact the health of the American public. FY05 highlights for the Public Health program included publishing the study *Confidentiality Issues and Policies Related to the Utilization and Dissemination of Geospatial Data for Public Health Applications* with the Socioeconomic Data and Applications Center (SEDAC) of Columbia University, co-sponsoring the Ecological Modeling Conference in Monterey, California, and publishing the article “NASA Space Systems Enhance Public Health Science for Society” in *Earth Observation Magazine*.

In FY05, the Public Health application supported projects to demonstrate the capacity of Earth science research results to enhance five public health decision support tools:

- ArboNET/Plague Surveillance System (PSS);
- National Environmental Public Health Tracking Network (EPHTN) / Health and Environment Linked for Information Exchange (HELIX) Atlanta demonstration project;
- Malaria Modeling and Surveillance (MMS) / Global Situational Awareness Tool (GSAT);
- The Public Health Applications in Remote Sensing (PHAiRS) / Rapid Syndrome Validation Project (RSVP); and,
- The Secretary's Command Center (SCC), Secretary of the Department of Health and Human Services (DHHS).

MAJOR ACCOMPLISHMENTS

ArboNET/Plague Surveillance System (PSS)

Plague prevention and response efforts were underway at regional, state and local levels through the Center for Disease Control and Prevention (CDC)-sponsored ArboNET/PSS. In FY05 the project team began using a climate-disease link tool developed by NASA-Goddard's Global Inventory Modeling and Mapping Studies (GIMMS) group to evaluate and measure improvements of the ArboNET/PSS. The GIMMS team extended the new global AVHRR-NDVI vegetation dataset at 8-km resolution and integrated it with TRMM, Landsat, SRTM, and MODIS datasets. The project team modified this application to report risk plague activity every month and to integrate data at different spatial and temporal resolutions. The project team also began work on a project website and completed an evaluation report on ArboNET/PSS in September 2005.

In FY06, the project team will develop a validation and verification report based on the relationship between climate variability and rodent population, which was a specific topic for a planned NASA-CDC partners meeting in October 2005.

* The FY05-09 Public Health Program Element Plan is available through: <http://aiwg.gsfc.nasa.gov/dss.html>

EPHTN/HELIX

As a partner with CDC's Environmental Public Health Tracking (EPHT) program in the HELIX-Atlanta project, the NASA Public Health team (especially NASA-Marshall) was active in all the project teams: Birth Defects, Air and Respiratory Health, Water, and Cancer. The partnership identified NASA Earth science observations for use in the projects, and NASA expertise in systems analysis led to the development of a quality control procedure for improving measurement of fine particulate matter.

In FY05, the Birth Defects team identified compatibility issues for the Public Health Information Network (PHIN), and it selected and enhanced the classification system for congenital heart defects appropriate for EPHT. The project team evaluated NASA satellite observation data for EPHT utility, completed an individual record review of over 3,000 heart defect cases by physicians, and developed and implemented a method for validating geocodes from the Metropolitan Atlanta Congenital Defects Program (MACDP) and Georgia's Office of Health Information and Policy (OHIP). The Cancer team completed a literature review and incorporated it into the project work plan. The team evaluated data from the Supplementary Guidance for Database Inventory Projects to identify information systems that could be employed. <http://www.cdc.gov/phin/>

The EPHTN/HELIX team published an initial benchmark report in September 2005, meeting FY05 IBPD metrics 5ESA2 and 5ESA7.

Malaria Modeling and Surveillance (MMS) / Global Situational Awareness Tool (GSAT)

In FY05, the project continued development of techniques to predict malaria cases based on meteorological and environmental parameters extracted from NASA Earth science satellite observations and climate time series. The project obtained malaria epidemiological records from the Thai Army's Pramongkul Hospital and the U.S. Armed Forces Research Institute for Medical Sciences in Thailand. The project team will use these data with remotely sensed environmental observations for training a nonparametric model for predicting malaria cases. The team is developing additional techniques to improve prediction accuracy when fewer epidemiological cases are available. In FY05, the Letter of Agreement to acquire the data (established in 2001) was extended four years to April 2009.

A FY05 report evaluating compatibility between the MMS project and the Air Force Special Operation Command's (AFSOC) GSAT concluded that the goals of the two efforts were comparable and complimentary. The report noted that enhancing the AFSOC GSAT with NASA Earth Science satellite observations and model predictive capabilities is likely to provide multiple benefits for the U.S. Department of Defense (DoD). The report stated that an enhanced GSAT capability should reduce morbidity and mortality for U.S. forces and populations in host countries, including improved utilization of larvicide, insecticide, and chemoprophylaxis. (Note: Nearly one-third of U.S. personnel involved in the 2003 Liberia operation contracted malaria). DoD plans to test the enhanced GSAT in real military exercises in 2006 and 2008, and the Public Health team has and will transmit data sets to AFSOC for use in those exercises.

REASoN Project: Public Health Applications in Remote Sensing (PHAiRS) / Rapid Syndrome Validation Project (RSVP)

In FY05, the project team regionalized the Dust Regional Atmospheric Model (DREAM) for applications in the southwestern U.S. by using dust events from 2003. The team identified and tested several remote sensing data sets for the DREAM model: MODIS land cover (MOD12), land surface temperature (MOD11/MYD11), vegetation index (MOD12), and leaf area index (MOD 15). The project team also completed the initial stages of developing GIS layers for the client mapping interface. The project completed an initial benchmark report, which stated that NASA Earth science satellite observations are

capable of improving dust episode forecasting significantly in the southwestern U.S.; the report served FY05 IBPD metrics 5ESA4 and 5ESA8. <http://www.phairs.unm.edu>

The project met with Sandia National Laboratory, Texas Tech University, and the University of Arizona to demonstrate the DREAM in a 3-D CAVE environment with and without NASA data. The project added the Texas Tech Health Sciences Center as a project partner to assist with analyzing public health data and reviewing relevant published public health data; Dr. James Speer is the primary contact.

Department of Health and Human Services' Secretary's Command Center (DHHS SCC)

The project sought to integrate NASA Earth science research results into the DHHS SCC, which is a central node in the operational public health community with federally-mandated responsibility for public health emergency preparedness and response activities. The project expected to complete a Memorandum of Understanding (MOU) with DHHS in FY05, however the MOU was delayed due to reorganization and changes of leadership at DHHS. The Public Health team will assess this activity and possibly seek to pursue the MOU further in FY06.

SOLICITATIONS

Decisions CAN

The Public Health application received 15 Step-1 proposals in the Decisions CAN and encouraged 10 to submit full proposals. In Step-2, the Public Health program received 11 full proposals.

Following the panel reviews and internal assessment for programmatic balance, the Applied Sciences Program selected one Public Health proposal for an award (in conjunction with the Air Quality program):

Three-Dimensional Air Quality System

PI: Raymond Hoff, University of Maryland–Baltimore County

The program also selected the following proposals for a single, combined project serving the Public Health, Agricultural Efficiency, and Disaster Management program elements:

Integrating NASA Earth Science Results into Malaria Early Warning Products to Enhance
USAID Food Security and Disaster Management Decision Making

PI: James Verdin, USGS EROS Data Center

Enhancing the Famine Early Warning System Network Decision Support System with NASA
Earth System Science Data and Modeling Results

PI: Molly Elizabeth Brown, NASA Goddard Space Flight Center

The Applied Sciences Program later selected additional proposals for one-year awards from a Congressionally-directed augmentation, including one project for the Public Health portfolio:

Integration of NASA Earth Science Data into Pan American Health Organization (PAHO) Health
Analysis and Information Decision Support

PI: Carlos Castillo-Salgado, Pan American Health Organization

ROSES 2005 – Section A.24

For the Applied Sciences portion of the ROSES 2005 NRA, the Public Health Program received 6 Step-1 proposals and encouraged 5 to submit full proposals. The Step-2 proposals were due in November 2005 with awards expected by April 2006.

PUBLICATIONS (SELECTED)

Chandy, B., “Elemental carbon, organic carbon, EC/OC ratio and PM_{2.5} trends in the Southwest as revealed by a Kolmogorov-Zurbenko (KZ) filter,” Master’s thesis, University of Arizona, 2005.

Golden, Meredith L., Robert R. Downs, and Kent Davis-Packard, “Confidentiality Issues and Policies Related to the Utilization and Dissemination of Geospatial Data for Public Health Applications,” The Socioeconomic Data and Applications Center, Columbia University, March 2005, New York, NY.

Haynes, John A. and Robert Venezia, “NASA Space Systems Enhance Public Health Science for Society,” *Earth Observation Magazine*, August 2005,
http://www.eonline.com/EOM_Aug05/article.php?Article=feature02.

Mahler, A.B. and C. Cattrell. 2005. *DREAM Algorithm Validation: Summary of Progress and Findings*. White paper.

Melton, Forrest, Brad Lobitz, Woody Turner, Edwin Sheffner, and John Haynes, “Ecological Modeling for Applied Science,” *EOS, Transactions*, American Geophysical Union, Vol. 86, No. 35, 30 August 2005, page 319.

Morain, Stanley and William Sprigg. 2005. *Initial Benchmark Report for Public Health (February 2004 – September 2005)*. Report prepared for NASA.

Morain, S.A. and A.M. Budge. 2004. “Satellite Technology for Assessing Biological Threats and Enhancing Bio-Surveillance,” in: B. Daniels (ed.) *Proceedings, Homeland Security: Toward Converging Partnerships*. BTR 2004 Unified Science and Technology for Reducing Biological Threats and Countering Terrorism. Pages 109-117.

Pinzon, Jorge E., James M Wilson, and Compton J. Tucker (2005). “Climate-based health monitoring systems for eco-climatic conditions associated with infectious diseases” (Systèmes de surveillance de santé des maladies infectieuses, basés sur les conditions climatiques), in *Bulletin de la Societe de Pathologie Exotique*, T. 98, n° 3, 239-243. (<http://www.pathexo.fr/pages/2005n3.html>)

Pinzon, Jorge E., Molly E. Brown, and Compton J. Tucker (2005). EMD Correction of “Orbital Drift Artifacts in Satellite Data Stream,” in *Hilbert-Huang Transform and its Applications*, edited by Norden E. Huang and Samuel SP Shen. World Scientific Publishing Company (September 1, 2005). Chapter 8: 167-186.

Yin, D., S. Nickovic, B. Barbaris, B. Chandy and W. Sprigg. 2005. “Modeling Wind-blown Desert Dust in the Southwestern United States for Public Health Warning: a Case Study,” *Atmospheric Environment*, 39: 6243-6254.

CONFERENCE/WORKSHOP PRESENTATIONS AND POSTERS (SELECTED)

Adeniyi, K. and W. Crosson, “Linking asthma exacerbation with exposure to particulate matter in the Atlanta metro area: Transforming environmental measurements for data linkage with HMO records,” *Environmental Public Health Tracking Network Annual Conference*, Atlanta, GA, April 20-21, 2005.

Benedict, Karl Kent, and William Hudspeth, “Technology Products of the PHAiRS REASON Project - Year 1,” presented at the 2005 *Sun-Earth System Technology Conference*, June 29, 2005. College Park, MD.

Hudspeth, William, et. al. 2005. “PHAiRS – A Public Health Decision Support System: Initial Results,” presented at the 31st *International Symposium for Remote Sensing of the Environment*. June 22, 2005. St. Petersburg, Russia.

Kiang, R. K., F. Adimi, V. Soika, and J. Nigro, “Assessing Malaria Risks in Greater Mekong Subregion based on Environmental Parameters,” *Proc. Int. Symp. On Remote Sensing of Environment*, 20-24 June 2005, St. Petersburg, Russia.

Morain, Stanley. 2005. "Dimensions of Remote Sensing for Environmental and Public Health," plenary session, *31st International Symposium for Remote Sensing of the Environment*. June 21, 2005. St. Petersburg, Russia.

Morain, Stanley A., A.M. Budge, T.K. Budge, S. Baros, K. Benedict, W. Hudspeth, C. Bales, G. Sanchez, W. Sprigg, D. Yin, B. Barbaris, B. Chandy, S. Nickovic, S. Caskey, J. Speer, and J. Bradbury. 2005. "Modeling Atmospheric Dust for a Public Health Decision Support System," *31st International Symposium for Remote Sensing of the Environment*. St. Petersburg, Russia.

Morain, Stanley and Amelia M. Budge. 2005. "Engineering Satellite Data for Environmental Health Issues," *Remote Sensing Arabia*. Riyadh, Saudi Arabia.

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